A METAL FRAME MADE UP OF THE UNION OF A PLURALITY OF EXTRUDED ELEMENTS, AND METHOD FOR ITS FABRICATION

TECHNICAL FIELD

The present invention relates to a metal frame made up of the union of a plurality of extruded elements and to a method for its fabrication.

The present invention finds advantageous application in the automotive sector for the fabrication of a metal frame of a motor vehicle, to which the ensuing treatment will make explicit reference without this implying any loss of generality.

BACKGROUND ART

A frame for a motor vehicle made up of the union of a plurality of extruded elements comprises a plurality of linear bars, which have a constant cross section, are obtained by extrusion, and are joined to one another by means of welding at structural nodes defined by jointing bodies provided with pockets for housing the ends of the linear bars themselves.

Currently, in a frame for a motor vehicle obtained by the union of a set of extruded metal elements, all the elements of the frame are obtained by extrusion, with the exception of the jointing bodies (i.e., the points

in which a number of elements of the frame are joined), which are obtained by casting in so far as they have a complex shape that cannot be obtained by extrusion. However, the jointing bodies obtained by casting prove heavy and costly (particularly in the case of limited production of sports cars) as a result of the high costs for fabrication of the dies. Furthermore, once a die for a jointing body has been made, it is difficult to make any modification to the die itself to provide constructional variants of the jointing body itself.

DISCLOSURE OF INVENTION

The purpose of the present invention is to provide a metal frame made up of the union of a plurality of extruded elements and a method for its fabrication, which are easy and economically advantageous to produce and implement and are, at the same time, free from the drawbacks described above.

In accordance with the present invention, a metal frame made up of the union of a plurality of extruded elements is provided according to what is specified in Claim 1 and, preferably, in any one of the subsequent claims depending directly or indirectly upon Claim 1.

In accordance with the present invention, a method for the fabrication of a metal frame made up of the union

of a plurality of extruded elements is provided according to what is specified in Claim 9 and, preferably, in any one of the subsequent claims depending directly or indirectly upon Claim 9.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described with reference to the annexed plate of drawings, which illustrate a non-limiting example of embodiment thereof, and in which:

- Figure 1 is a perspective view of a part of a frame made according to the present invention and comprising a jointing body and a number of linear bars;
- Figure 2 is an exploded perspective view of the **frame** of Figure 1;
- Figure 3 is a perspective view of a load-bearing element obtained by extrusion of the jointing body of Figure 1;
- Figure 4 is a perspective view of a pair of closing metal sheets of the jointing body of Figure 1;
- Figure 5 is a schematic perspective view, with parts removed for reasons of clarity, of a frame of a motor vehicle made according to the present invention;
- Figure 6 is a perspective view, at an enlarged scale, of a jointing body of the frame of Figure 5 set in a position corresponding to an area of attachment of a front suspension;

- Figure 7 is a perspective view of a load-bearing element obtained by extrusion of the jointing body of Figure 6;
- Figure 8 is a perspective view of a pair of closing metal sheets of the jointing body of Figure 6; and
- Figure 9 is a perspective view of a simple element designed to provide a load-bearing element of the same type as that of Figure 7.

BEST MODE FOR CARRYING OUT THE INVENTION

In Figure 1, designated by the reference number 1 is a metal frame, which is only partially illustrated and comprises a number of linear bars 2, which have a constant cross section, are obtained by extrusion, and are joined to one another by means of welding at structural nodes defined by jointing bodies 3. In particular, Figure 1 illustrates a node of the frame 1, which is defined by a respective jointing body 3 and is designed to obtain the union of four linear bars 2. According to what is illustrated in Figure 2, the jointing body 3 has four pockets 4, each of which is designed to house an end of a corresponding linear bar 2.

According to what is illustrated in Figures 3 and 4, the jointing body 3 is of a box type and is made up of the union of a load-bearing element 5, which is

substantially obtained by extrusion and has a given direction 6 of extrusion, with a pair of plane closing metal sheets 7, which are set perpendicular to the direction 6 of extrusion and are welded to the load-bearing element 5 on opposite sides of the load-bearing element 5 itself.

Preferably, the plane closing metal sheets 7 are welded to the load-bearing element 5 by means of a welding of an FSW (Friction-Stir Welding) type. Said known welding methodology enables a weld between two metal elements to be carried out by acting on just one of the two metal elements and in particular on the metal element set in a more accessible position. In Figure 1, the reference number 8 designates the lines of welding that join a closing metal sheet 7 to the load-bearing element 5. Preferably, also the jointing body 3 is welded to the linear bars 2 by means of a weld of an FSW type. In Figure 1, the reference number 9 designates the areas of welding that join the jointing body 3 to the linear bars 2.

According to what is illustrated in Figure 3, the jointing body 3 comprises a further plane metal sheet 10 set parallel to the direction 6 of extrusion of the load-bearing element 5 and welded to the load-bearing element 5 itself to define a respective pocket 4. The

metal sheet 10 could be obtained by direct extrusion at the moment of fabrication of the load-bearing element 5. However, it is preferable to weld the metal sheet 10 to the load-bearing element 5 subsequently and after having coupled to the load-bearing element 5 the linear bar 2 which is inserted in the pocket 4 defined by the metal sheet 10 both to enable a convenient insertion of the linear bar 2 and to enable recovery of any play or interference caused by the tolerances of fabrication.

During fabrication of the frame 1, the closing metal sheets 7 are welded to the load-bearing element 5 prior to coupling of the respective linear bars 2 to the load-bearing element 5 itself, or else at least one closing metal sheet 7 is welded to the load-bearing element 5 after having coupled a number of respective linear bars 2 to the load-bearing element 5 itself. The choice between the two modalities of fabrication described above depends both upon possible production constraints, which impose, for example, insertion of a linear bar 2 with a transverse movement and not with a longitudinal movement and upon the need to recover any play or interference caused by the tolerances of fabrication.

According to a different embodiment, the load-bearing element 5 of a jointing body 3 is formed by the lateral

union of a number of simple elements 11 (one of said elements 11 is illustrated in Figure 9), each of which is obtained directly via extrusion and has a given direction 6 of extrusion parallel to the direction 6 of extrusion of the other simple elements 11. Said constructional modality is normally used when the load-bearing element 5 of a jointing body 3 has large dimensions and a complex shape. The simple elements 11 making up a load-bearing element 5 are joined to one another laterally via welding and/or by being slotted together mechanically (like the pieces of a jig-saw puzzle). Preferably, all the simple elements 11 making up one and the same load-bearing element 5 are the same as one another.

More complex geometries such as ones involving angles of other than 90° between the linear bars 2 or different extrusion sections can be obtained, starting from the jointing body 3 described above, by machining the load-bearing element 5 according to the different planes and appropriately bending the closing metal sheets 7.

Figure 5 illustrates a frame 1 of a motor vehicle made of aluminium. In a way similar to the frame 1 illustrated in Figures 1-4, the frame 1 illustrated in Figure 5 comprises a number of linear bars 2, which

have a constant cross section, are obtained by extrusion, and are joined to one another by means of welding at structural nodes defined by jointing bodies 3. In particular, four jointing bodies 3 are present in the area of attachment of each suspension.

Figure 6 is a perspective view of a jointing body 3 of the frame of Figure 5 set in an area of attachment of a front suspension. According to what is illustrated in Figures 7-9, the jointing body 3 is of a box type and is made up of the union of a load-bearing element 5, which is substantially obtained by extrusion and has a given direction 6 of extrusion, with a pair of plane closing metal sheets 7, which are set perpendicular to the direction 6 of extrusion and are welded to the load-bearing element 5 on opposite sides of the load-bearing element 5 itself. In Figure 6, the reference number 8 designates the lines of welding that join a closing metal sheet 7 to the load-bearing element 5.

The metal frames 1 described above present various advantages, in so far as the jointing bodies 3 of said frames 1 prove to be light on account of the presence of internal cores and prove to be simple and economically advantageous to produce particularly in the case of limited production. Furthermore, it is extremely simple and fast to make constructional

variants even to individual jointing bodies 3.